pressure of its contents, upon the isolated arterial bulb. The most striking temperature observation is, that the bulb, when brought to heat-standstill at or a little above 40° C., will nearly always beat again if the temperature be still raised two or three degrees.

H. NEWELL MARTIN.

LETTERS TO THE EDITOR.

Algae and spray markings.

INCIDENTAL to a note in Nature (xxvii. 46) on Invertebrate casts *versus* algae in paleozoic strata, the writer would call attention to the fact, that he has seen many track-like markings made by dried seaweeds blown along the shore. In some cases a series of parallel indentations, as if some animal had walked along, were made by the stiff projections of the rolling plant. These algae tracks and markings are very similar to many fossil tracks which have been figured.

Forms similar if not identical with those described by Billings as Arenicolites spiralis from St. John's, Newfoundland, have been seen by the writer to be formed on the beach by the spray. This was especially observed last autumn at Marblehead Neck. The spray dashing over a projecting rock, and falling on the wet sands left by the retreating tide, produced a series of drop and ring like markings in the sand, varying in size from minute drops to those one or two inches in diameter. This corresponds, as regards size, with the specimens of Arenicolites collected by the writer at the Newfoundland locality. The common form of the larger spray markings is that of a ring, with a raised centre and a depressed border, surrounded by the displaced sand. The appearance is as if the drop fell like a partly closed bell of a jelly-fish, and then expanded outward in every direction, carrying the sand with it, but leaving the central portion untouched. These forms would probably be somewhat modified by the next tide, causing variations in the structure, if not obliterating the forms for the most part. As in Newfoundland, so on this modern beach, the impressions are seen crowded together, as well as singly. (See *Can. nat.*, (2), vi. 478; *Geol. survey Canada, pal. foss.*, ii. 77; *Amer. journ. sc.*, (3), iii. 223.)

M. E. WADSWORTH.

Cambridge, Mass., Jan. 9, 1883.

Geology of Lake Superior.

I am pleased to learn from a communication published in your number of Feb. 9, and signed A. R. C. Selwyn, that the present head of the Geological survey of Canada has arrived at conclusions with regard to the geology of the Lake-Superior region precisely similar to those reached and published by Foster and Whitney over thirty years ago.

That it would have been well for the Canada survey, and for geological science generally, if more attention had been paid by Mr. Logan and his assistants to the results of the survey carried on along the south shore of the lake by the U.S. geologists, during the years 1848 to 1850, will, it is thought, become apparent to every geologist who reads a work prepared by Dr. Wadsworth and myself, soon to appear in the bulletin of the Museum of comparative zoölogy, and entitled 'The azoic system and its subdivisions.'

J. D. WHITNEY.

Cambridge, Feb. 12, 1883.

Rock disintegration in hot, moist climates.

Some remarks of Nordenskiöld, in his 'Voyage of the Vega,' pp. 707–713, relating to precious stones, suggest the thought that the marked differences which occur as to the manner and rate of the weathering of granitic rocks at the north and at the south can hardly be so familiar to European scientific men as they are to American observers. At the south it is common enough to find soils that have been formed 'in place,' from the thorough and deep-seated chemical decomposition of the rocks on which they rest; while at the north, well-marked disintegration of this sort is rarely met with, even in places where the observer is not perplexed and confused by the mechanical results of glacial action. The subject has often been alluded to by American geologists, working in our southern states, notably by Professors Kerr of North Carolina, and Stubbs of Alabama, who have expressed themselves in the following terms: Speaking of the geologic formation which, "after hugging the east side of the Appalachian chain of mountains and forming some of the most valuable farming lands of the Atlantic states, enters the central eastern part of Alabama," Professor Stubbs says, "The rocks which by disintegration have given the soils of this section are mainly granites, gneisses, feldspars, hornblendes, mica-schists, etc.; and much the greater part of the section is covered by soils which have resulted from disintegration of the above-mentioned rocks *in situ*. And here I may remark a notable feature of these soils, — a feature which cannot fail to arrest the attention of every northern geologist: viz., that decomposition of these rocks in southern latitudes has proceeded much farther than with the same rocks in higher latitudes, and therefore has given us deeper soils. It is difficult to find in the north a soil over a few feet deep; while here it is not uncommon to find in railroad-cuts, wells, etc., disintegrated strata to the depth of thirty, fifty, or even seventy-five feet. This can be accounted for to a large extent by climatic influences. The warm waters, charged with carbon dioxide, percolating throughout the year the easily permeable strata, act continuously as a chemical agent in the work of disintegration; while farther north not only the amount of water, the temperature, and the chemical activity are reduced, but for one-half of the year the soil is locked up by frost from all access of decomposing agencies."

The influence of these soils of disintegration upon the agriculture of the regions in which they occur, has often been noticed; and their bearing upon the history of the use and manufacture of commercial fertilizers in this country is no less clearly marked. It would seem to be plain, that disintegration such as this, when accompanied with or followed by denudation, would readily account for the accumulation, and, so to say, concentration in 'pockets,' or other places of rest, of any heavy or refractory minerals which were originally contained, dispersed, in the native rock; and that among the multitude of individuals thus thrown together there would be much greater likelihood of finding superior specimens than can be obtained by searching the comparatively meagre deposits that are formed at the north.

The statement of Nordenskiöld, above referred to, is here given in condensed form.

"Precious stones occur in Ceylon mainly in sand-beds, especially at places where streams of water have flowed which have rolled, crumbled down, and washed away a large part of the softer constituents of the sand, so that a gravel has been left which contains more of the harder precious-stone layer than the originally sandy strata or the rock from which they originated. Where this natural washing ends, the gem collector begins. He searches for a suitable valley, digs down a greater or less depth from the surface to the layer of clay mixed with coarse sand resting on the rock, which experience has taught him to contain gems. . . . The yield is very variable, sometimes abundant, sometimes very small. . . . Sapphires are found much more commonly than rubies. . . . The precious stones occur in nearly every river valley which runs from the mountain-heights in the interior of the island down to the lowland. . . . But some one perhaps will ask, Where is the mother-rock of all these treasures in the soil of Cey-

lon? The question is easily answered. All these minerals have once been embedded in the granitic gneiss which is the principal rock of the region" (and which weathers readily). . . . "In weathering, the difficultly decomposable precious stones have not been attacked, or attacked only to a limited extent: they have therefore retained their original form and hardness. When in the course of thousands of years, streams of water have flowed over the weathered rock, the softer constituents have been for the most part changed into a fine mud, and as such washed away, while the hard gems have only been inconsiderably rounded and little diminished in size. The current of water, therefore, has not been able to wash them far away from the place where they were originally embedded in the rock; and we now find them collected in the gravel-bed, resting for the most part on the fundamental rock which the stream has left behind, and which afterwards, when the water has changed its course, has been again covered by new layers of mud, clay, and sand. . . . Of all the kinds of stones which are used for ornaments, there are both noble and common varieties, without there being any perceptible difference in their chemical composition. The most skilful chemist would have difficulty in finding, in their chemical composition, the least difference between corundum and sapphire or ruby; between common beryl and emerald; between the precious and common topaz; between the hyacinth and the common zircon; between precious and common spinel: and every mineralogist knows that there are innumerable intermediate stages between these minerals which are so dissimilar, though absolutely identical in composition. This gave the old naturalists occasion to speak of ripe and unripe precious stones. They said that in order to ripen precious stones the heat of the south was required. This transference of well-known circumstances from the vegetable to the mineral kingdom is certainly without justification. It points, however, to a remarkable and hitherto unexplained circumstance; namely, that the occurrence of precious stones is, with few exceptions, confined to southern regions. . . . Another remarkable fact in connection with precious stones is, that most of those that come into the market are not found in the solid rock, but as loose grains in sand-beds. True jewel-mines are few, unproductive, and easily exhausted. From this, one would be inclined to suppose that precious stones actually undergo an ennobling process in the warm soil of the south."

To the writer of this note, it seems more reasonable to suppose that the greater abundance of noble gems in southern climates should be attributed to the more active and thorough-going disintegration which occurs in those regions, and to the consequent — comparatively speaking — enormous accumulation and concentration of the precious minerals, as above suggested. Other things might be far from being equal, and yet the chance of finding a stone of price be greater in a heap of ten thousand rough jewels than in a collection which contains but a few score.

Bussey Institution. F. H. Storer.

The November aurora in California.

Auroras are exceedingly rare phenomena in southern California; yet we had the pleasure of witnessing one Nov. 17, at which time a great electric storm raged over North America and Europe. The photographic traces during the time from Nov. 10 to Nov. 20 are very interesting; as they have preserved a perfect record of the twitchings and jerkings, large and small, fast and slow, to which the magnets were subjected during this time.

A slight shock of earthquake was reported here on Jan. 23, about 5.20 P.M. I was on the street, and did not feel it; and so far as I can detect no harm was done at the observatory. Marcus Baker.

Los Angeles, Cal., Jan. 26.

TRYON'S CONCHOLOGY.

Structural and systematic conchology: an introduction to the study of the Mollusca; by George W. Tryon, Jr. Vol. I. Philadelphia, *the author.* 1882. 8 + 312 p., cuts, 22 pl. 8°.

We have received the first volume of Mr. Tryon's new work (to be completed in three volumes), intended as an introduction to the study of the mollusks. This portion consists of some general considerations, a description of the anatomy, habits, and economy, distribution in space and time, notes on nomenclature, classification and collection, of mollusks. Assistance in paleontological matters has been rendered by Prof. Angelo Heilprin. The work is well printed and bound; but the plates, though not so bad as in the 'Manual' of the same author, contain mostly inferior renderings from old and familiar figures, produced by processes which cannot be made to yield really good results. The map is very badly drawn, and besides this, through 'overlaying,' resulting from folding and inferior or excessive ink, has become nearly illegible. Mr. Tryon frankly disclaims authorship for his compilation, which is derived almost wholly from Woodward's well-known 'Manual,' and the earlier parts of Dr. Paul Fischer's 'Manuel de conchyliologie,' now in process of publication. Since both these works are accessible at a total price less than that of the first volume of Mr. Tryon's book, it is not clear why the latter should exist. Perhaps the future volumes will explain.

Meanwhile we do not feel that any very warm welcome should be extended to a work of compilation so destitute of perspective as this. Though not what the author would have made it had Lovèn's work on the dentition of mollusks appeared ten years earlier, Woodward's book is nevertheless a thoroughly coherent manual, in which the parts retain proper proportions to each other and to the whole. There are many statements in it which are now obsolete, or supplemented by more precise, fuller, or more accurate information. Groups not recognized by Woodward have attained their majority, and no longer train timidly in the leading-strings of a few bold specialists. The study of embryology, histology, and general anatomy, has entirely changed the situation so far as the point of view is concerned; but the great merits of Woodward, as originally published, are as conspicuous as ever. The work of Dr. Fischer is directly on Woodward's lines, and embodies of course much of his information; but it is not a mere revision, an ill-considered conglomeration like that of Tate, nor such a compilation as the present one of Tryon's. Silk and leather are good in their places; but man does not patch one with the other, or, doing so, repents of it. Mr. Tryon's first volume appears to us to resemble a mosaic of granite, chalk, precious stones, and mud, which is not delightful to the eye, neither will it wear. The work of the last twenty years in general, except so far as embodied in the ex-